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**Datasheet for the decision  
of 13 March 2013**

**Case Number:** T 1809/11 - 3.3.06

**Application Number:** 03746435.1

**Publication Number:** 1502992

**IPC:** D21H 13/50, H01M 4/96

**Language of the proceedings:** EN

**Title of invention:**

Carbon fiber paper and porous carbon electrode substrate for fuel cell therefrom

**Patent Proprietor:**

MITSUBISHI RAYON CO., LTD.

**Opponent:**

Toray Industries, Inc.

**Headword:**

Carbon fibre paper with high surface area ratio/TORAY

**Relevant legal provisions (EPC 1973):**

EPC Art. 83, 54(1)(2), 56

**Keyword:**

"Admissibility of inventive step objection - admitted"

"Admissibility of documents filed with the grounds of appeal - admitted"

"Novelty - yes"

"Inventive step - yes"

**Decisions cited:**

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**Catchword:**

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Case Number: T 1809/11 - 3.3.06

**DECISION**  
of the Technical Board of Appeal 3.3.06  
of 13 March 2013

**Appellant:** Toray Industries, Inc.  
(Opponent) 1-1, Sonoyama 1-chome, Otsu  
Shiga 520-8558 (JP)

**Representative:** Hager, Thomas Johannes  
Hoefer & Partner  
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Pilgersheimer Strasse 20  
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**Respondent:** MITSUBISHI RAYON CO., LTD.  
(Patent Proprietor) 6-41, Konan 1-chome  
Minato-ku  
Tokyo 108-8506 (JP)

**Representative:** HOFFMANN EITLE  
Patent- und Rechtsanwälte  
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**Decision under appeal:** Decision of the Opposition Division of the  
European Patent Office posted 14 June 2011  
rejecting the opposition filed against European  
patent No. 1502992 pursuant to Article 101(2)  
EPC.

**Composition of the Board:**

**Chairman:** P.-P. Bracke  
**Members:** E. Bendl  
U. Tronser

## Summary of Facts and Submissions

- I. The appeal lies from the decision of the Opposition Division to reject the opposition against the European patent no. 1 502 992.
- II. On 09 August 2011 the Appellant/ Opponent filed an appeal against the decision of the Opposition Division. The receiving dates of the appeal fee and of the statement of grounds of the appeal were 09 August and 24 October 2011, respectively. In the statement of grounds inter alia reference was made to documents

D1 = CA-A-2 347 432  
D2 = US-A-4 851 304  
D3 = US-B-6 326 098  
D7 = English translation of JP-A-11-217734  
D8 = English translation of JP-A-2000-  
160436  
D15 = Paper by Zenji Izumi, Toray Basic  
Research Laboratories, Kagaku, 44(6)  
372-373, 1989

which had already been mentioned before in opposition procedure. Furthermore, additional documents were cited for the first time in the procedure, among them

D19 = Affidavit of Mr Mikio Inoue  
D20 = Affidavit by Mr Kazuyuki Yakushiji  
D26 = JP-A-09-324 390 and its translation  
into English language  
D27 = JP-A-2000-144 521 and its translation  
into English language.

III. The parties' requests are summarized in item VI below.

IV. Claim 1 of the main request of the Proprietor/  
Respondent reads as follows:

"1. A porous carbon electrode substrate for a fuel cell, wherein said porous carbon electrode substrate has a structure in which at least two carbon fiber papers each containing a carbonized resin are laminated, and at least one of the carbon fiber papers is a carbon fiber paper comprising carbon fibers having a surface area ratio of 1.05 or more, said carbon fibers being produced using a polymer composed mainly of acrylonitrile as a raw material, and being obtainable by a process consisting of a spinning step of spinning a acrylonitrile-based fiber, a flame-retarding step of heating and firing the fiber in an air atmosphere of at least 200 °C and at most 400 °C to convert the fiber into, an oxidized fiber, and a carbonizing step of heating and carbonizing the oxidized fiber in an inert atmosphere at least at 300 °C and at most at 2,500 °C."

Claims 2-9 are dependent on Claim 1.

V. The main arguments of the **Appellant** were as follows:

Admissibility of the inventive step objection

- The Opposition Division erred in its conclusions with regard to the requirement of inventive step. Therefore the arguments brought forward in opposition procedure were repeated in the grounds of appeal.

Admissibility of the documents submitted with the grounds of appeal

- These documents are to be seen as a reaction to the discussion in the course of the oral proceedings before the Opposition Division and the arguments laid down in the decision.

Sufficiency of disclosure

- Details necessary for carrying out the invention like the composition of the polymer and parameters describing how to obtain the required surface area ratio have not been indicated in the patent-in-suit. Therefore the person skilled in the art does not know whether an embodiment falls inside/outside the scope of the claims. As a consequence the invention is not sufficiently disclosed.

Novelty

- Each of documents D1-D3 or D26 destroys novelty of the subject-matter of present Claim 1.

Inventive step

- D1 or alternatively D2 may be taken as the closest state of art. Their combination with either of D7, D8, D27 or the combination of D26 with D27 leads to the claimed invention in an obvious way.

The main arguments of the **Respondent** were as follows:

Admissibility of the inventive step objection

- It has not been indicated by the Appellant why the Opposition Division's decision with regard to inventive step is wrong. Therefore the

corresponding objection should not be admitted into the appeal procedure.

Admissibility of the documents submitted for the first time with the grounds of appeal

- The documents could have been filed in opposition and should therefore not be admitted into the appeal procedure.

Sufficiency of disclosure

- The Appellant only made assertions with regard to sufficiency of disclosure without providing any proof.

Novelty

- None of the documents referred to by the Appellant as being detrimental to the novelty of the claimed subject-matter discloses a surface area ratio of 1.05 or more. Therefore, novelty of the claimed subject-matter is given.

Inventive step

- None of the documents cited by the Appellant discloses that the surface area ratio has an impact on the flexibility and the distribution of the fibres in the carbon electrode substrate. Therefore, all documents cited with regard to inventive step and their combinations do not render the claimed subject-matter obvious.

VI. The Appellant requested that the decision under appeal be set aside and that the European patent no. 1 502 992 be revoked.

The Respondent requested that the appeal be dismissed or alternatively that the patent be maintained on the basis of one of the auxiliary requests 1 or 2, submitted with the letter of 10 May 2012.

## **Reasons for the Decision**

1. Admissibility of the inventive step objection
  - 1.1 The passage on page 8 of the grounds of appeal reading "The argumentation with respect to D1 or D2 as closest prior art and either of D7 or D8 as additional document [...] is maintained" implies that the Appellant considers the Opposition Division to have interpreted wrongly the facts and arguments already presented by the Appellant. This passage is followed by further arguments and a reference to the corresponding reasoning of the grounds of opposition, where some of the arguments were also discussed in detail.
  - 1.2 Thus, in the present case the Appellant's statement, the discussion of additional arguments and the reference are considered to sufficiently set out why the Appellant requests the decision under dispute to be reversed.
2. Admissibility of the documents submitted with the grounds of appeal
  - 2.1 The Board takes the view that the arguments submitted by the Appellant in the grounds of appeal, which were supported by the said documents, are a reaction to the arguments laid down by the Opposition Division in its

decision and are a more detailed reasoning being based essentially on the same line of argumentation as brought forward in the course of the opposition procedure.

- 2.2 Therefore, the Board does not see any reasons not to accept the documents in question.

Main request

3. Sufficiency of disclosure

- 3.1 The objections raised by the Appellant are not considered to be relevant for the following reasons:

- a) Lack of details concerning the polymer and the parameters applied

In enclosure 3 of D19, an affidavit of Mr Mikio Inoue, one of the Appellant's experts, reference is made to "factors of the precursor that can change the surface area ratio of carbon fibre". Although details like "the polymer composition, molecular weight, solvent drawing speed/ratio and so on" are not given in the document referred to it is concluded that it "is deemed that the person skilled in the art can determine an appropriate condition" (enclosure 3 of D19, page 3/3, last full paragraph).

Thus, even the Appellant's own expert confirms that the composition of the polymer as well as the parameters applied are known to the skilled person. Therefore, lack of detailed information with



regard to the composition of the polymer or the parameters to be applied cannot be considered to result in a lack of sufficient disclosure.

- b) The question whether a product falls inside/outside the claimed invention

This question is considered to relate to clarity rather than to sufficiency of disclosure. However, since the present main request is identical to the claims as granted, clarity of the wording of the claims is not an issue to be discussed.

- 3.2 Given the considerations as stated above the invention is considered to be sufficiently disclosed.

4. Novelty

4.1 Novelty of Claim 1 vis-à-vis D1

- 4.1.1 D1 does not disclose **in detail** how the products were manufactured. As the processing conditions have a significant influence on the properties of the final product, it cannot be derived from this anticipation without any doubt whether a surface area ratio of at least 1.05 was achieved.

- 4.1.2 Appellant's argument that some of the parameters defining the products of D1 are close to the ones of the products according to the patent-in-suit does **not** allow to draw the conclusion that the products according to D1 are identical to the ones presently claimed. This is for instance shown by Comparative example 1 of the patent-in-suit, which describes a

product with a bending strength, gas permeability coefficient and through-plane resistivity in accordance with the products of the patent-in-suit, although the surface area ratio of this product is lower than defined in present Claim 1.

4.1.3 Thus, when starting either from these parameters or from the processing steps (in general) it cannot be concluded that the surface area ratio of the products according to D1 automatically falls within the claimed range. Therefore D1 is not considered to be novelty-destroying.

4.2 Novelty of Claim 1 vis-à-vis D2

4.2.1 Although affidavits were submitted by the Appellant showing that prior to the priority date of D2 at least one batch of Torayca T300 fibres had a surface area ratio as presently claimed (see D20, the table on page 2/3), it has not been disputed that earlier Torayca T300 fibres with different properties existed (D15, Fig.2).

4.2.2 As no reference could be found in D2 indicating the production date of the Torayca T300 fibres, it is possible that "old" Torayca fibres with unknown surface area ratio were used.

4.2.3 Thus, since there is no direct and unambiguous disclosure in D2 that all requirements as presently claimed are met, D2 cannot be considered to be novelty-destroying.

4.3 Novelty of Claim 1 vis-à-vis D3 or D26

4.3.1 D3 discloses in Example 5 the use of TGP-H-060, which was, according to the Appellant, produced from Torayca T300 fibres. Examples 5 and 6 of D26 also use Torayca T300 fibres.

4.3.2 Thus, as the production dates of those Torayca T300 fibres are not known, the considerations made with regard to D2 apply accordingly.

5. Inventive step

According to the problem and solution approach, which is used by the Boards of Appeal of the European Patent Office in order to decide on the question of inventive step, it has to be determined which technical problem the object of a patent solves vis-à-vis the closest prior art document. It also has to be determined whether or not the solution proposed to overcome this problem is obvious in the light of the available prior art disclosures.

5.1 D1 in combination with D27

5.1.1 The patent-in-suit aims at providing an electrode substrate for a fuel cell which is flexible and shows a uniform dispersion of the carbon fibres (see paragraph [0005]).

The Appellant mainly focused on D1 as the closest prior art document. This anticipation refers to carbon fibre paper suitable as an electrode substrate for a fuel cell and is described to be excellent in flexibility.

Having regard to the remaining documents presently available the Board shares the view that D1 is a suitable starting point for the problem and solution approach.

5.1.2 The problem of Claim 1 on file with regard to D1 is the provision of a porous carbon electrode substrate with a more uniform dispersion of the carbon fibres.

5.1.3 As the solution to this problem the porous carbon electrode substrate according to Claim 1 on file is presented.

The substrate according to Claim 1 differs from the disclosure of D1 in a surface area ratio of 1.05 or more.

5.1.4 The Appellant did not object that the problem has been solved over the entire scope claimed. The Board shares this view.

5.1.5 The question to be clarified is whether it was obvious to a person skilled in the art, when starting from D1, to arrive at the claimed invention.

Tables 1 and 2 of the patent-in-suit show inter alia that carbon fibre papers having a surface area ratio of at least 1.05 possess an improved dispersion of the carbon fibres (as reflected by the tensile strength ratio MD/CMD).

D1 does not give a hint towards the impact of the surface area ratio on this parameter. Therefore, the

claimed subject-matter cannot be rendered obvious when considering D1 alone.

The Appellant suggested to combine the teaching of D1 with the content of D27. The latter document refers to acrylonitrile-based fibre bundles suitable for use as a precursor for a carbon fibre **thread**. As areas of application aircrafts, sports and general industrial applications like civil engineering and construction are mentioned. Thus, the fibre bundles are intended to be used in technologies different from the electrode substrates for fuel cells presently claimed.

However, even when assuming that the skilled person would look into a different technical field, paragraph [0009] of D27 describes that the fibre bundles possess 2 to 15 wrinkles of 0.5 to 1.0  $\mu\text{m}$  in height. In spite of Appellant's attempts to demonstrate that those wrinkles may be equated with the surface area ratio as claimed, there is no teaching that the fibre bundles of D1 can be used for the porous carbon electrode substrate of the patent-in-suit. Appellant's argument that the skilled person would extract from D27 the teaching with regard to the surface area ratio of the **fibre bundles** and apply it to the **fibres** of D1 cannot be followed either, since neither of those documents gives any hint to do so.

Thus, D1 or its combination with D27 do not lead to the claimed subject-matter in an obvious way.

5.2 The combination of D1 with D7 or D8

According to the Appellant instead of D27 either of documents D7 or D8 may be used in combination with D1 in order to arrive at the present invention.

D7 describes the manufacture of carbon fibre reinforced composite material. The surface area ratios proposed in D1 (1.02 to 1.2) overlap with the range presently claimed. However, the effect of using the **specific** ratios of at least 1.05, as demonstrated by the examples of the patent-in-suit, has not been recognized in D1 and therefore even a combination of D1 with D7 would not lead to the claimed invention.

Similar considerations are also true for D8, which discloses carbon fibres with surface area ratios of 1.02 to 1.09.

5.3 D2 as the closest state of the art

In an alternative approach D2 was proposed as the closest state of the art. In analogy to D1 the surface area ratio is not given in this disclosure. Consequently, considerations as made above for the document when taken alone or in combination with either of D7 or D8 are of relevance.

5.4 D26 in combination with D27

D26 in combination with D27 was cited by the Appellant to be of relevance. As discussed above, D26 refers to a carbon fibre paper, but the effect of the surface area ratio has not been discussed in this disclosure either.

Since D27 concerns fibre bundles with wrinkles, also the combination of both documents does not render the claimed subject-matter obvious.

5.5 Therefore, the claimed subject-matter involves an inventive step.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar

The Chairman

D. Magliano

P.-P. Bracke